DURA-POWER MODELS NW 37- 670

COMMERCIAL ELECTRIC WATER BOILERS

• Installation • Operation • Service • Maintenance • Limited Warranty

STANDARD H

⚠ CAUTION

TEXT PRINTED OR OUTLINED IN RED CONTINS INFORMATION RELATIVE TO YOUR SAFETY. PLEASE READ THOROUGHLY BEFORE INSTALLING AND USING THE APPLIANCE.

⚠ FLOOD WARNING

IF THE BOILER SHOULD BECOME IMMERSED IN WATER AT ANY TIME, THE BOILER SHOULD BE EXAMINED BY A COMPETENT SERVICE PERSON BEFORE IT IS RETURNED TO SERVICE.

A.O. SMITH
WATER PRODUCTS COMPANY

A DIVISION OF A.O. SMITH CORPORATION
RENTON, WASHINGTON
www.hotwater.com

PLACE THESE INSTRUCTIONS ADJACENT TO THE BOILER AND NOTIFY OWNER TO KEEP FOR FUTURE REFERENCE.BE SURE THAT THE WARRANTY INFORMATION HAS BEEN FILLED IN ON COMPLETION OF INSTALLATION.

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PART NO. 60047-002 REV.2

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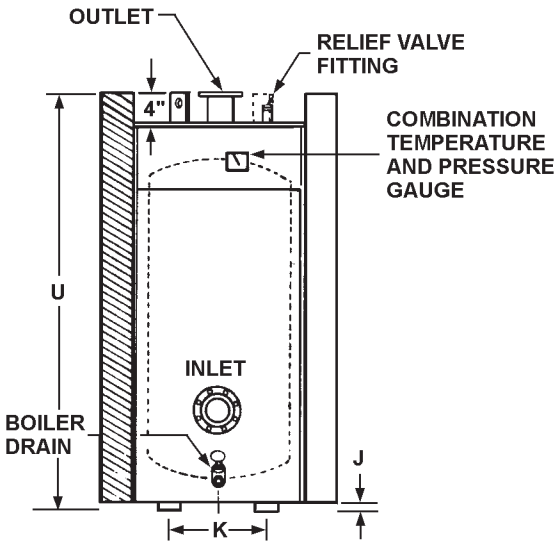
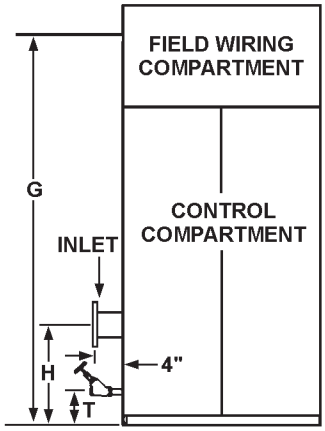
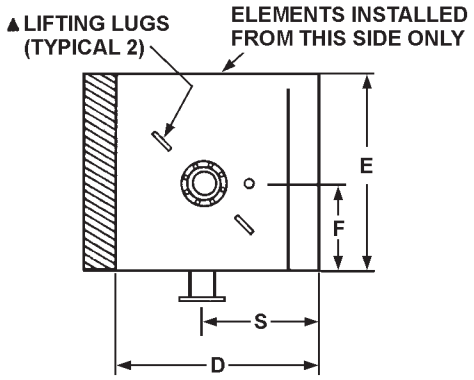
DIMENSIONAL DATA



UL MINIMUM CLEARANCE REQUIREMENTS:
24" ALL SIDES, 12" TOP

NOTE: ALLOW 30" CLEARANCE FOR HINGED CONTROL COMPARTMENT DOORS, ELEMENTS CAN BE CHANGED WITH 24" CLEARANCE.





BOILERS WITH SINGLE CONTROL PANEL CAN BE FURNISHED WITH PANEL MOUNTED RIGHT OR LEFT SIDE FACING INLET.

AN ADDITIONAL CONTROL PANEL IS REQUIRED ON UNITS ABOVE 500 KW RATED 208 OR 240 VOLTS, 480 VOLT UNITS WILL REQUIRE ONLY ONE PANEL.

SIZES AND DATA 45KW THRU 720KW

Model Number													Inlet* &	Boiler
Prefix	Gal.Cap.	Std.KWInput	D	E	F	G**	H	J	K	S	T	U	Outlet*	Drain
NW	37	45K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	37	60K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	37	75K	32	30	12	42	12 1/2	-	-	20	4	42	2	1
NW	37	90K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	37	105K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	37	120K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	37	150K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	37	180K	32	30	12	42	12 1/2	-	-	20	4	42	3	1
NW	60	210K	32	30	12	57	12 1/2	-	-	20	4	57	3	1
NW	60	240K	32	30	12	57	12 1/2	-	-	20	4	57	3	1
NW	60	270K	32	30	12	57	12 1/2	-	-	20	4	57	3	1
NW	60	300K	32	30	12	57	12 1/2	-	-	20	4	57	3	1
NW	96	330K	40	38	16	691/2	17	1 1/2	17	24	5	78	4	1 1/4
NW	96	390K	40	38	16	69 1/2	17	1 1/2	17	24	5	78	4	1 1/4
NW	96	420K	40	38	16	69 1/2	17	1 1/2	17	24	5	78	4	1 1/4
NW	96	450K	40	38	16	69 1/2	17	1 1/2	17	24	5	78	4	1 1/4
NW	96	480K	40	38	16	69 1/2	17	1 1/2	17	24	5	78	4	1 1/4
NW	150	540K	54	44	19	69 1/2	20	2	20	27	5 1/2	69 1/2	5	1 1/2
NW	150	600K	54	44	19	69 1/2	20	2	20	27	5 1/2	69 1/2	5	1 1/2
NW	150	660K	54	44	19	69 1/2	20	2	20	27	5 1/2	69 1/2	5	1 1/2
NW	150	720K	54	44	19	69 1/2	20	2	20	27	5 1/2	691/2	5	1 1/2

* All fittings under 4” will be threaded type. All fittings 4” and larger will be flanged. 3” fittings extend 4” beyond jacket.

** Where overall height is a problem a larger diameter vessel with a reduced height may be furnished.

▲ Lifting lugs and channel skid base on 96 gallon and larger units.

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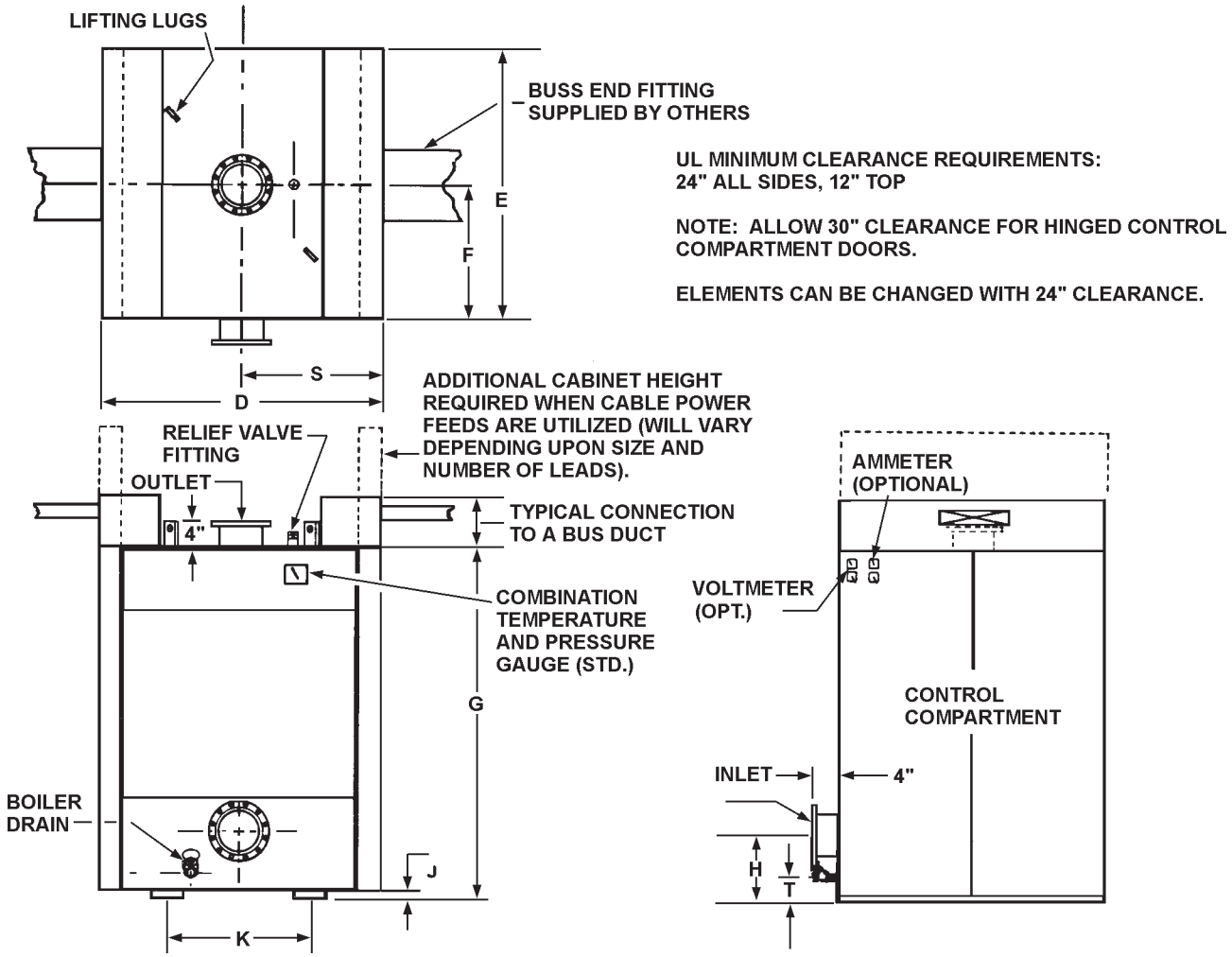

SIZES AND DATA 780KW THRU 3300KW

Model Number												Inlet* &	Boiler
Prefix	Gal.Cap.	Std.KWInput	D	E	F	G**	H	J	K	S	T	Outlet*	Drain
NW	220	780K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	220	840K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	220	900K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	220	960K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	220	1020K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	220	1080K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	220	1140K	60	50	25	71	21	2	25 1/2	30	5 1/2	5	1 1/2
NW	334	1200K	60	50	25	99	25	2	25 1/2	30	7 1/4	6	2
NW	334	1260K	60	50	25	99	25	2	25 1/2	30	7 1/4	6	2
NW	334	1380K	60	50	25	99	25	2	25 1/2	30	7 1/4	6	2
NW	334	1500K	60	50	25	99	25	2	25 1/2	30	7 1/4	6	2
NW	334	1620K	60	50	25	99	25	2	25 1/2	30	7 1/4	6	2
NW	334	1740K	60	50	25	99	25	2	25 1/2	30	7 1/4	6	2
NW	400	1800K	66	56	28	90 1/2	25 1/2	2 1/2	30	33	7 3/4	8	2
NW	400	1860K	66	56	28	90 1/2	25 1/2	2 1/2	30	33	7 3/4	8	2
NW	400	1980K	66	56	28	90 1/2	25 1/2	2 1/2	30	33	7 3/4	8	2
NW	400	2100K	66	56	28	90 1/2	25 1/2	2 1/2	30	33	7 3/4	8	2
NW	500	2200K	72	62	31	90 1/2	26 1/2	2 1/2	34	36	7 3/4	8	2
NW	500	2340K	72	62	31	90 1/2	26 1/2	2 1/2	34	36	7 3/4	8	2
NW	500	2460K	72	62	31	90 1/2	26 1/2	2 1/2	34	36	7 3/4	8	2
NW	500	2580K	72	62	31	90 1/2	26 1/2	2 1/2	34	36	7 3/4	8	2
NW	670	2700K	78	68	34	96 1/2	30 1/2	2 1/2	38	39	7 3/4	8	2
NW	670	2820K	78	68	34	96 1/2	30 1/2	2 1/2	38	39	7 3/4	8	2
NW	670	2940K	78	68	34	96 1/2	30 1/2	2 1/2	38	39	7 3/4	8	2
NW	670	3060K	78	68	34	96 1/2	30 1/2	2 1/2	38	39	7 3/4	8	2
NW	670	3180K	78	68	34	96 1/2	30 1/2	2 1/2	38	39	7 3/4	8	2
NW	670	3300K	78	68	34	96 1/2	30 1/2	2 1/2	38	39	7 3/4	8	2

NOTE: For boilers 3400KW to 6000KW, consult factory.

* All fittings under 4" will be threaded type. All fittings 4" and larger will be flanged.

** Where overall height is a problem a larger diameter vessel with a reduced height may be furnished.

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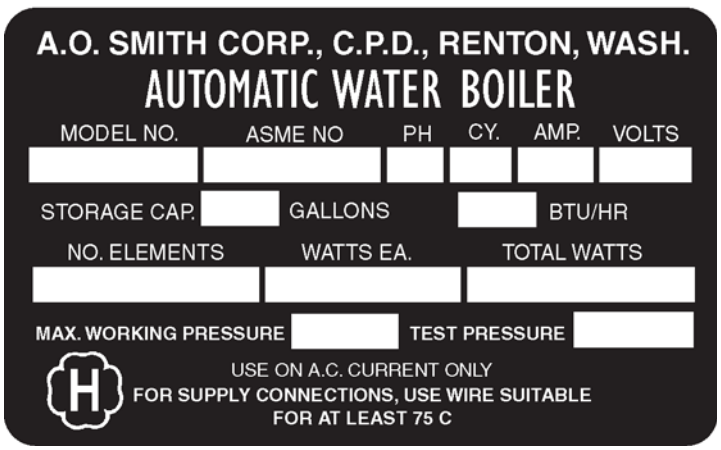
ELECTRICAL/RECOVERY DATA

WATER BOILER SPECIFICATIONS

Model Number			BTU Output	Gal./Hr. 100°F Rise	Number of Elements	Number of Steps	Standard Number and KW of Steps	Amperage 3 Phase			
Prefix	Gal. Cap.	Std. KW Input						208v	240V	480V	575V
NW	37	45K	153,585	180	3	1	1@45	128	108	55	45
NW	37	60K	204,720	240	4	1	1@60	171	144	73	60
NW	37	75K	255,975	300	5	1	1@75	213	180	90	75
NW	37	90K	307,170	369	6	3	3@30	250	217	108	90
NW	37	105K	358,365	430	7	4	3@30+1@15	292	253	126	105
NW	37	120K	409,560	492	8	4	4@30	334	289	144	121
NW	37	150K	511,950	615	10	5	5@30	417	361	180	151
NW	37	180K	614,340	738	12	5	4@30+1@60	500	433	216	181
NW	60	210K	716,730	861	14	5	3@30+2@60	584	505	252	211
NW	60	240K	819,120	984	16	5	2@30+3@60	668	577	288	241
NW	60	270K	921,510	1107	18	5	1@30+4@60	751	650	324	271
NW	60	300K	1,023,900	1230	20	5	5@60	834	722	360	301
NW	96	330K	1,126,290	1353	22	6	5@60+1@30	917	794	396	331
NW	96	360K	1,228,680	1476	24	6	6@60	1001	866	432	362
NW	96	390K	1,331,070	1599	26	7	6@60+1@30	1084	938	468	392
NW	96	420K	1,433,460	1722	28	7	7@60	1168	1010	504	422
NW	96	450K	1,535,850	1845	30	8	7@60+1@30	1251	1083	540	452
NW	96	480K	1,638,240	1968	32	8	8@60	1334	1155	576	487
NW	150	540K	1,843,020	2214	36	9	9@60	1501	1299	648	542
NW	150	600K	2,047,800	2460	40	10	10@60	1668	1443	720	602
NW	150	660K	2,252,580	2706	44	10	8@60+2@90	▲	▲	792	663
NW	150	720K	2,457,360	2952	48	8	8@90	▲	▲	864	723
NW	220	780K	2,662,140	3198	52	9	8@90+1@60	▲	▲	936	783
MW	220	840K	2,866,920	3444	56	10	9@90+1@30	▲	▲	1008	843
NW	220	900K	3,071,700	3690	60	10	10@90	▲	▲	1080	904
NW	220	960K	3,276,480	3936	64	10	8@90+2@120	▲	▲	1152	964
NW	220	1020K	3,481,260	4182	68	10	6@90+4@120	▲	▲	1224	1024
NW	220	1080K	3,636,040	4428	72	10	4@90+6@120	▲	▲	1296	1084
NW	220	1140k	3,890,820	4674	76	10	2@90+8@120	▲	▲	1368	1145
NW	334	1200K	4,095,600	4920	80	10	10@120	Not Recommended	Not Recommended	1440	1205
NW	334	1260K	4,300,380	5166	84	10	8@120+2@150	▲	▲	1512	1265
NW	334	1380K	4,709,940	5658	92	10	4@120+6@150	▲	▲	1656	1386
NW	334	1500K	5,119,500	6150	100	10	10@150	▲	▲	1800	1506
NW	334	1620K	5,529,060	6642	108	15	6@90+9@120	▲	▲	1944	1627
NW	334	1740K	5,938,630	7134	116	15	2@90+13@120	▲	▲	2068	1747
NW	400	1800K	6,143,400	7380	120	15	15@120	▲	▲	2160	1807
NW	400	1860K	6,348,180	7626	124	15	13@120+2@150	▲	▲	2232	1868
NW	400	1980K	6,757,740	8118	132	15	9@120+6@150	▲	▲	2376	1988
NW	400	2100K	7,167,300	8610	140	15	5@120+10@150	▲	▲	2520	2109
NW	500	2200K	7,576,860	9102	148	15	1@120+14@150	▲	▲	2664	2229
NW	500	2340K	7,986,420	9594	156	20	18@120+2@90	▲	▲	2808	2350
NW	500	2460K	8,395,980	10080	164	20	18@120+2@150	▲	▲	2952	2470
NW	500	2580K	8,805,540	10578	172	20	14@120+6@150	▲	▲	3096	2590
NW	670	2700K	9,315,100	11070	180	20	10@120+10@150	▲	▲	3240	2711
NW	670	2820K	9,624,660	11562	188	20	6@120+14@150	▲	▲	3384	2832
NW	670	2940K	10,034,220	12054	196	20	2@120+18@150	▼	▼	3528	2952

NOTE: For boilers 3000KW to 6000KW consult factory.

MODEL AND RATING PLATE



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FOREWORD

APPROVALS

These designs comply with requirements of Underwriters Laboratories and bear the U.L. label on the cabinet.

All models are built to the standards of Section lV of the American Society of Mechanical Engineers. Boiler and Pressure Code, inspected and identified by this symbol.

The ASME plate is located on the tank above the cleanout opening. When specified, the National Board of Boiler and Pressure Vessel Inspectors listing will be furnished and identified by an NB number on the ASME plate.

INSTALLATION CODE REQUIREMENTS

In addition to these instructions, the equipment shall be installed in accordance with those installation regulations in force in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

In absence of local codes the installation must comply with the latest edition of the National Electrical Code, NFPA 70. Copies of this document are available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

GROUNDING

Grounding and electrical wiring connected to the boiler must conform to the latest edition of the National Electric Code, NFPA 70.

Figure 1, below, is an illustration of a typical model NW/Commercial Electric Hot Water Boiler with the features called out.

FEATURES

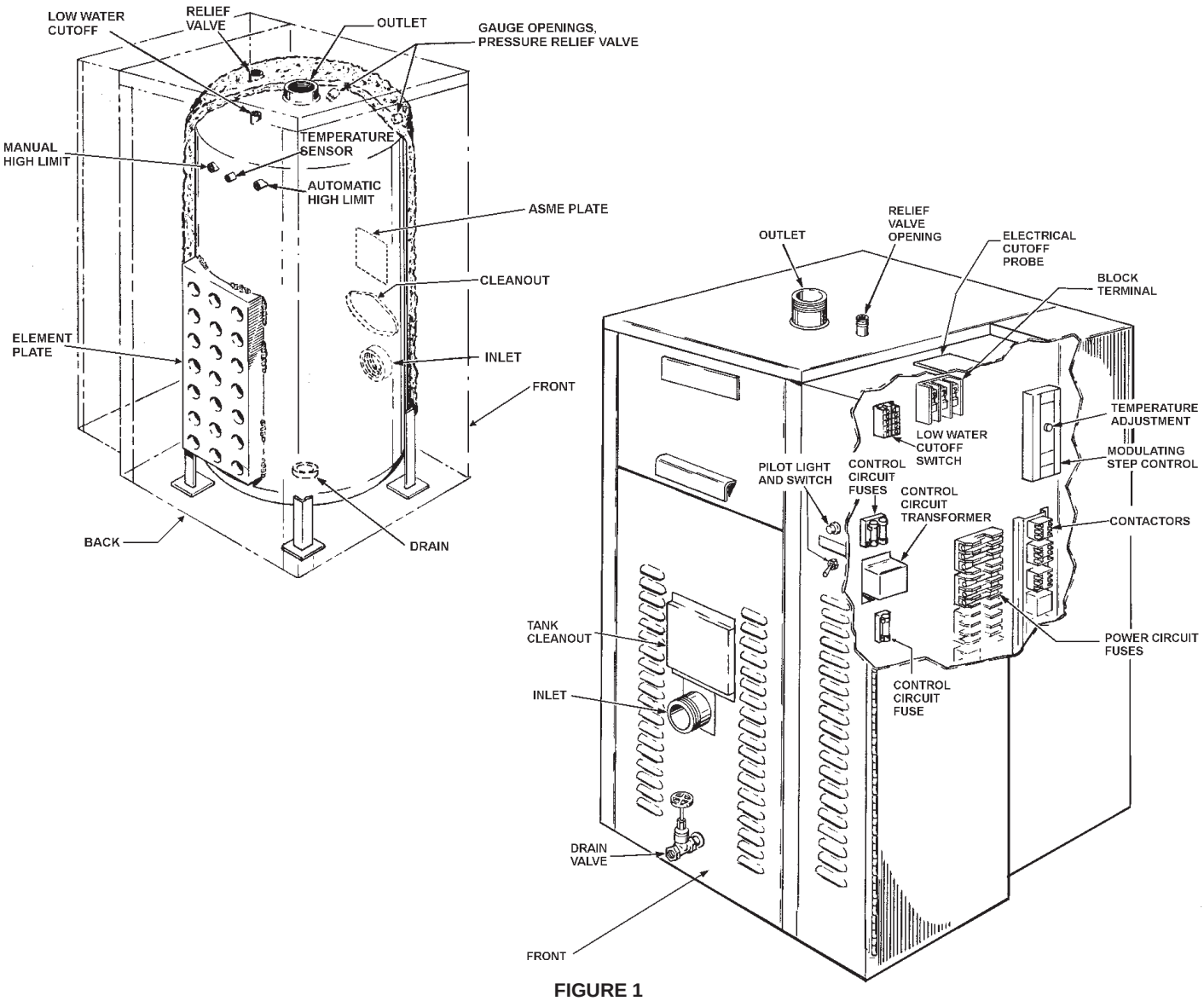

FIGURE 1

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IMPORTANT

IT IS RECOMMENDED THAT A QUALIFIED SERVICE TECHNICIAN PERFORM THE INITIAL FIRING OF THE BOILER. AT THIS TIME THE USER SHOULD NOT HESITATE TO ASK THE TECHNICIAN ANY QUESTIONS WHICH THEY MAY HAVE IN REGARD TO THE OPERATION AND MAINTENANCE OF THE BOILER.

BEFORE FILLING THE SYSTEM FOR OPERATION the hot water system should be internally cleaned and flushed to remove any contaminants which may have accumulated during installation. See section of this manual titled SYSTEM CLEANING.

RELIEF VALVE

An ASME rated pressure relief valve is furnished with the boiler. A fitting for the relief valve is provided in the top of the boiler. A drain line from the relief valve should terminate near a suitable drain. Do not thread, plug, or cap the end of the drain line.

The pressure setting of the relief valve should not exceed the pressure capacity of any component in the system including the boiler.

HIGH TEMPERATURE DEVICES

Automatic Device

The boiler control circuit contains a high temperature cutoff switch. This device shuts off the heating elements if excessive water temperatures are reached. The high temperature cutoff has an adjustable range of 100° to 240°F and automatically resets on a drop of temperature.

Manual Device

A manual reset high limit will be in the control circuit in addition to the automatic device previously described. The control has an adjustable range of 110° to 290°F and must be manually reset after a drop of temperature.

Reset button is located under the right side panel of the boiler. Disconnect the power before removing the panel to push the button.

INSTALLATION

REQUIRED ABILITY

INSTALLATION OR SERVICE OF THIS BOILER REQUIRES ABILITY EQUIVALENT TO THAT OF A LICENSED TRADESMAN IN THE FIELD INVOLVED. PLUMBING AND ELECTRICAL WORK ARE REQUIRED.

GENERAL

Do not test electrical system before boiler is filled with water, follow START UP procedure in this manual.

The principal components of the boiler are identified in Figure 1. The model and rating plate, see illustration on page 4, provides certain useful information required at installation. Both of these references should be used to identify the boiler and its components.

Water boilers are usually placed in series with the heating system on the outlet side of the circulating pump. The boiler piping should include inlet and outlet water valves to permit maintenance and service work to be performed without disturbing the rest of the system.

Detailed system installation drawings are normally provided by the equipment purchaser or system designer.

LOCATING THE BOILER

For the best installation, the boiler should be located:

1. On a level surface.

   - Shim the channel type skid base as necessary if leveling is required.

2. Near a floor drain.

   - The boiler should be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the boiler or to lower floors of the structure. When such locations cannot be avoided, a suitable drain pan should be installed under the boiler.

     The pan should be at least two inches deep, have a minimum length and width of at least two inches greater than the dimensions of the boiler and should be piped to an adequate drain.

   - The discharge opening of the relief valve should always be piped to an open drain.

3. Suggested clearances from adjacent surfaces are found on a label attached to the control compartment door.

   - UL minimum clearances:
     - 24” all sides
     - 12” top
   - Allow clearance for hinged control compartment doors.
   - Elements can be changed with 24” clearance.

4. The boiler may be installed in a confined space if adequate ventilation is provided.

ELECTRICAL

General

Check the boiler model and rating plate information against the characteristics of the branch circuit electrical supply. Do not connect the boiler to an improper source of electricity.

Voltage applied to the boiler should not vary more than + 5% to -10% of the model and rating plate marking for satisfactory operation.

Do not energize the branch circuit for any reason before the boiler is filled with water. Doing so may cause the heating elements to burn out. Such damage is not covered under the terms of the warranty.

The branch circuit is connected to the block through an opening provided on top of the boiler.

The boiler should be connected to a separate, grounded, branch circuit with overcurrent protection and disconnect switch. These are part of the electrical supply system not components of the boiler, as such they are obtained locally. The boiler should be grounded in accordance with national and local codes.

Branch Circuit

The branch circuit wire size should be established through reference to the National Electrical Code or other locally approved source in conjunction with boiler amperage rating. Branch circuit wiring which connects to the boiler terminal block should be temperature rated at 75°C. For convenience, portions of the wire size tables from the Code are reproduced here. It is suggested the electrician size the branch circuit at 125 percent of the boiler rating and further increase wire size as necessary to compensate for voltage drop in long runs. Branch circuit voltage drop should not exceed 3% at the boiler.

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Calculating Amperage/Overcurrent Protection

The boiler is factory wired for connection to three wire single-phase or three and four wire three-phase branch circuits. In addition, a ground conductor may be required.

A diagram of the wiring is furnished with the boiler for the electrician's use. An amperage table is on page 4 of this manual. The boiler model and rating plate provides full load amperage data.

The rating of the overcurrent protection should be computed on the basis of 125 percent of the total connected load amperage. Where the standard ratings and settings do not correspond with this computation, the next higher standard rating or setting should be selected.

Boiler Circuits

The boiler's electrical components are pictured and identified on page 5. The model and rating plate illustration on page 4 identifies the electrical characteristics. Basically, there are two electrical circuits:

- The control circuit, where the temperature control directly or indirectly operates the contactor coils.
- The power circuit, which is operated by the control circuit, carries the electrical load of the heating elements.

The following describes the circuits and includes typical wiring diagrams. All circuits are designed for 60 or 50 Hertz alternating current.

Refer to ELECTRICAL CONFIGURATION TABLE, below, and wiring diagram provided with your boiler before completing connections to electrical supply.

NOTE: Wiring diagrams in this manual are typical examples. The specific wiring diagram for your boiler is the one supplied with the boiler.

Control Circuit

All control circuits are operated on single-phase 120V. A transformer is used in the control circuit.

Control circuit wiring is 14 Awg, THHN or THWN type, rated 600 volts, 105°C.

Seperate instructional literature is provided with the boiler for the modulating solid state step control.

Portion of Table 310-16
Allowable Ampacities of Insulated Copper Conductors

Not more than three conductors in raceway or cable or direct burial (based on ambient temperature of 30°C, 86°F.)

Size	Temperature Rating of Conductor. See Table 310-13 in Code
AWG MCM	75°c (167°F) TYPES RH, RHW, RUH (14-2), THW, THWN, XHHW, USE
18	- - - - -
16	- - - - -
14	15
12	20
10	30
8	45
6	65
4	85
3	100
2	115
1	130
1/0	150
2/0	175
3/0	200
4/0	230
250	255
300	285
350	310
400	335
500	380
600	420
700	460
750	475
800	490
900	520
1000	545
1250	590
1500	625
1750	650
2000	665

Portion of Table 310-16
Allowable Ampacities of Insulated Aluminum and Copper-Clad AluminumConductors

Not more than three conductors in raceway or cable or direct burial (based on ambient temperature of 30°C, 86°F.)

Size	Temperature Rating of Conductor. See Table 310-13 in Code
AWG MCM	75°C (167°F) TYPES RH, RHW, RUH (12-2), THW, THWN, XHHW, USE
12	15
10	25
8	40
6	50
4	65
3	75
2	90
1	100
1/0	120
2/0	135
3/0	155
4/0	180
250	205
300	230
350	250
400	270
500	310
600	340
700	375
750	385
800	395
900	425
1000	445
1250	485
1500	520
1750	545
2000	560

These capacities relate only to conductors described in Table 310-13 in Code.

For ambient temperatures over 30°C, see Correction Factors, Note 13 in Code

Power Circuit

The boiler is equipped with one of the power circuit configurations shown in the table.

Power circuit wiring is type THHN, rated 600 volts, 105°C, sized as necessary.

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ELECTRICAL CONFIGURATION TABLE

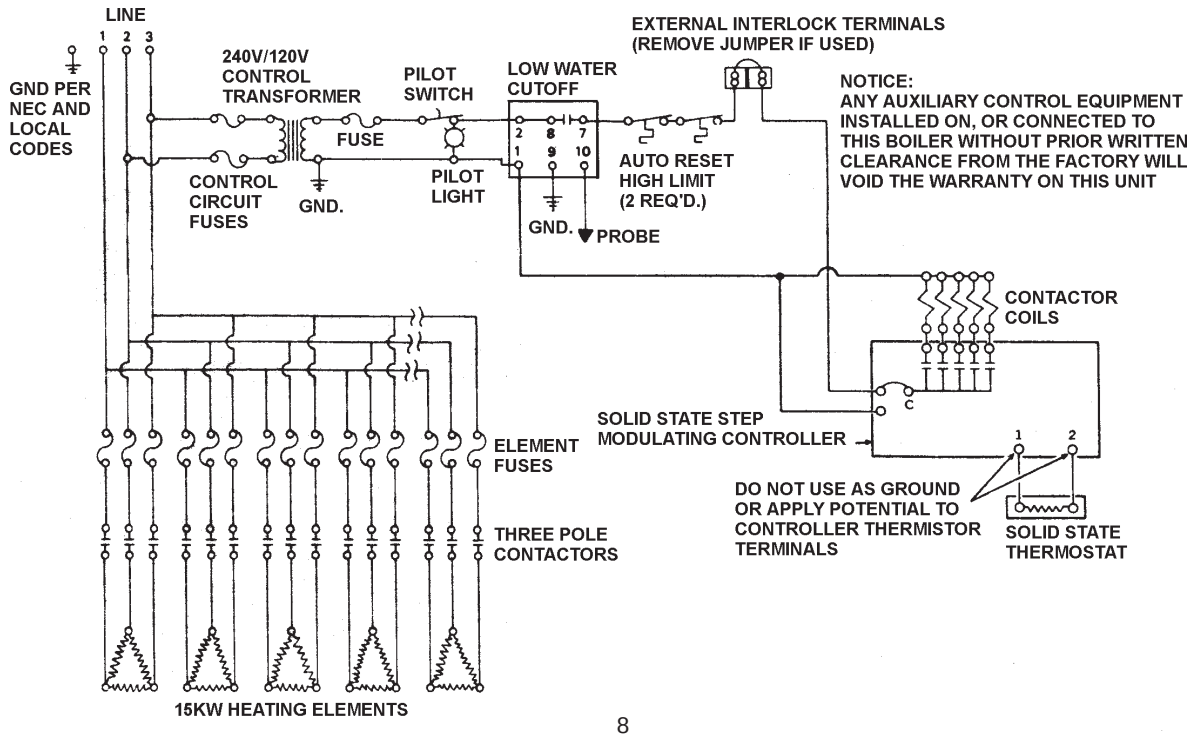
Boiler Nameplate Markings		Type of Service	Voltage Between Boiler Terminal Lugs	Control Circuit Voltage (1 Phase)	Elements	
Voltage	Phase				Quantity Per Contractor	Element Operating Voltage
208	1		L1 L2 N G ● ← 208 → ←– – –120→	120	1	208
	3	Delta (With Neutral)	L1 L2 L3 N G ● ← 208 → ← 208 → ← 208 → ←– – – – 120 →	120	1	208
240	1		L1 L2 G ● ← 240 →	120	1	240
	3	Delta	L1 L2 L3 G ● ← 240 → ← 240 → ← 240 →	120	1	240
480	3	Wye*	L1 L2 L3 G ● ← 480 → ← 480 → ← 480 →	120	1 or 2	277
480	3	Delta	L1 L2 L3 G ● ← 480 → ← 480 → ← 480 →	120	1or 2	480

* Neutral lug not necessary and not furnished due to three wire wye connection. This means only three wires (no neutral) brought to boiler due to method of element connection. Elements operate at 277 volts.
Voltage from a conductor to ground (electrical raceway and water pipes) is not measured.
No ground lug furnished. If required installer can provide locally.

TYPICAL WIRING DIAGRAMS

The following wiring diagrams are included in this manual to show typical arrangements of electrical components in the control and power circuits by voltage and phase charactreristics. They are to be used as a reference by the installer or servicer in performing their work. A diagram of the boiler wiring is furnished with the boiler.

WIRING DIAGRAM 208V OR 240V THREE-PHASE (DELTA) WITH STEP CONTROL


LINE
1 2 3
GND PER NEC AND LOCAL CODES
240V/120V CONTROL TRANSFORMER
PILOT SWITCH
LOW WATER CUTOFF
EXTERNAL INTERLOCK TERMINALS (REMOVE JUMPER IF USED)
NOTICE: ANY AUXILIARY CONTROL EQUIPMENT INSTALLED ON, OR CONNECTED TO THIS BOILER WITHOUT PRIOR WRITTEN CLEARANCE FROM THE FACTORY WILL VOID THE WARRANTY ON THIS UNIT
FUSE
CONTROL CIRCUIT FUSES
GND.
PILOT LIGHT
AUTO RESET HIGH LIMIT (2 REQ'D.)
GND.
PROBE
CONTACTOR COILS
SOLID STATE STEP MODULATING CONTROLLER
ELEMENT FUSES
THREE POLE CONTACTORS
DO NOT USE AS GROUND OR APPLY POTENTIAL TO CONTROLLER THERMISTOR TERMINALS
SOLID STATE THERMOSTAT
15KW HEATING ELEMENTS

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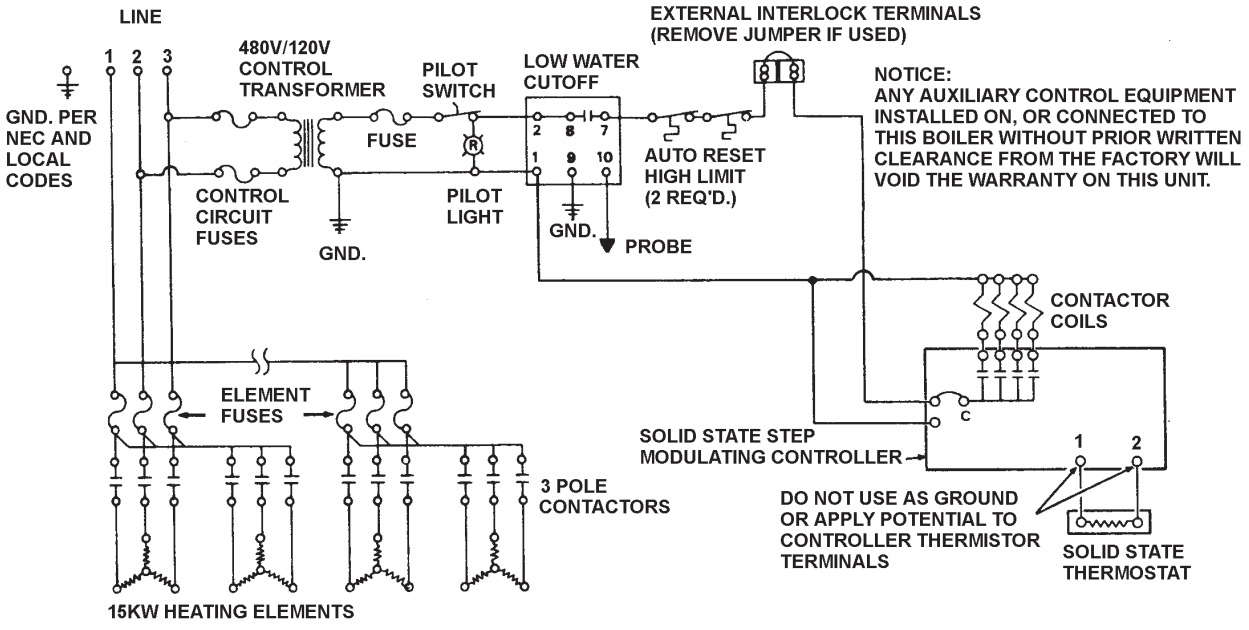
WIRING DIAGRAM 480V THREE-PHASE (WYE)



NOTE: ELEMENTS OPERATE AT 277 VOLTS DUE TO WYE CONNECTION AT ELEMENTS

SYSTEM CLEANING

The hot water system should be internally cleaned and flushed to remove contaminants which may have accumulated during installation. System cleaning provides chemical stability necessary for component life and system performance.

Failure to clean the system may cause:

1. Poor heating due to formation of gas.
   - Residual pipe dope, thread cutting oil, solder flux, dirt and other foreign materials breakdown to form gas. This is indicated by a continuing need for purging even through the system is “closed”.

2. Pump seal leakage.
   - Acidic water (low pH) and contamination such as soil and sand result in premature or recurring pump seal failures.

3. Automatic air valve leakage.
   - Contaminants cause sticky sealing surfaces and result in leakage.

4. Relief valve operation.
   - Gas formation increases system pressure and relief valve spillage.

5. Water leaks at joints and fittings.
   - Corrosion and eventual failure of connections occur when system pH is low.

6. Noisy operation.
   - Heat transfer surfaces can be fouled with dirty, oily water. This plus gas lead to noisy water circulation.

⚠ WARNING

Be sure to turn off power when working on or near the electrical system of the boiler. Never touch electrical components with wet hands or when standing in water. When replacing fuses always use the correct size for the circuit.

OPERATION

GENERAL

Never operate the heating elements without being certain the boiler is filled with water and a pressure relief valve is installed in the relief valve opening provided.

An electronic type low water cutoff is provided on all boilers as standard equipment. The water probe is installed near the top of the tank to monitor the presence of water. The control circuit is opened if the water level is below this point.

The pilot switch on the cabinet front permits the boiler to be turned on and off without having to operate the electrical disconnect switch. Additional switches may be provided for manually operating contactor coils.

⚠ WARNING

Full power is present whenever the cabinet door is opened even with the pilot switch(es) turned off. Never operate the boiler with cabinet doors open or panels removed.

FILLING

Refer to SYSTEM CLEANING section for preparing the system prior to final filling and operation.

Hard Water: in areas which have hard water it may be desirable to fill the system with soft water and/or provide water treatment as recommended by a consultant familiar with local conditions. In this way harmful water scale build-up on the heating elements is minimized.

1. Close the boiler drain valve and system valves as necessary.

2. Open a vent in the highest point of the system to allow the air to escape.

3. Fully open the make-up water inlet valve. Fill the boiler and piping.

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4. Close the vent as water starts to flow from the opening. Place the make-up water valve in the desired position. The boiler is now ready for START UP and TEMPERATURE REGULATION if being placed in operation for the first time.

START UP

The following checks should be made by the installer when the boiler is placed into operation for the first time:

1. Check all factory and field made water and electrical connections for tightness.
   - Repair water leaks and tighten electrical connections as necessary.
2. Turn on the electrical disconnect switch and pilot switch(es) mounted on the boiler cabinet.
3. Observe the operation of the boiler during the first heating cycle.
   - Temperature control and contactor operation should be checked by allowing the boiler to come up to temperature and shutoff automatically.

TEMPERATURE REGULATION

Always turn off the electricity at the electrical disconnect switch when making a temperature control adjustment.

It is suggested the temperature adjustment be turned to the lowest setting which satisfies the hot water requirements of the system.
- Additional instructional literature is provided with the boiler for adjusting this control.

Always close and lock the cabinet door after making a temperature adjustment. Turn on electricity.

DRAINING

The boiler must be drained if it is to be shut down and exposed to freezing temperatures. Maintenance and service procedures may also require draining the boiler.

1. Turn off the electrical disconnect switch.
2. Close the make-up water valve and system valves as necessary.
3. Open a nearby outlet to vent the parts of the system being drained.
4. Open the boiler drain valve.
5. If the boiler is being drained for an extended shutdown, it is suggested the drain valve be left open during this period.
   - Follow FILLING instructions to restore boiler to service.

MAINTENANCE

Boiler maintenance includes periodic tank flushing and cleaning, and removal of lime scale from the heating elements. Circulating pumps should be oiled.

MAINTENANCE SCHEDULE

Component	Operation	Interval	Required
Tank	Flushing	Monthly	
	Sediment Removal	As Needed	
Elements	Lime Scale Removal	As Needed	UN•LIME® Delimer and element gaskets.
Circulating Pump(s)	Oiling	Per pump makers instructions	

Tank flushing and circulating pump lubrication should be performed in accordance with the above schedule. Tank sediment removal and element lime scale removal must be performed when needed as determined by period inspections. Following are the instructions for performing recommended maintenance.

FLUSHING

1. Turn off the electrical disconnect switch.
2. Open the boiler drain valve. Allow water to flow to an open drain until it runs clean. Do not come in contact with the water being drained as it may be very hot.
3. Close the drain valve when finished flushing.
4. Turn on the electrical disconnect switch.

SEDIMENT REMOVAL

Water borne impurities consist of fine particles of soil and sand which settle out and form a layer of sediment on the bottom of the tank. In time, if not removed, the level of sediment might reach the heating elements.

For convenience, sediment removal and element lime scale removal should be performed at the same time as follows:

WATER AND LIME SCALE REMOVAL

Water and lime scale accumulations on the heating elements is a normal condition, common to all immersion type elements. Factors which affect the amount of this formation are:

1. Amount of make-up water used. As the volume of make-up water heated increases, more scale results.
2. Water temperature. As the temperature of the water is increased, more scale is deposited on the elements.
3. Characteristics of water supply. Regardless of water treatment, the elements should be examined regularly.

Water scale accumulations may cause noises to occur during operation.

It is recommended that a lower heating element be removed periodically for examination. If it is scaled, all of the elements should be removed and cleaned. If the tank bottom has an accumulation of sediment, it should be cleaned.

Lime scale should be removed from the elements by dissolving the accumulation in UN•LIME® delimer. UN•LIME is a non-muriatic delimer, available through your dealer or distributor. Do not use muratic or hydrochloric acid base deliming solutions to remove lime scale from the elements. Do not pour delimer into tank.

All models:

1. **Turn off electrical disconnect switch.**
2. Drain the boiler following DRAINING instructions.
3. Remove the cabinet panel which covers the heating elements.
   - Remove insulation as necessary to reach the element area.
4. Remove the bolts from each element and remove the elements from the opening.
   - Disconnect element wiring as necessary.

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- Use a twisting, pulling action to remove elements scaled beyond the size of the tank opening.
- Brush loose scale from elements.
- Silicates, sulfates and aluminates must be removed by scraping or other mechanical means. Lime scale dissolvents will not remove these types of scale which are occasionally encountered.

5. Lime scale removal:
   - Place limed ends of heating elements into UN•LIME delimer and allow scale to dissolve. Do not permit delimer or water to contact heating element electrical terminals.
6. Flush cleaned ends of elements with water when deliming or cleaning is completed.
7. Remove sediment and scale from the tank bottom through the tank cleanout.
   - The make-up water valve and boiler drain valve may be opened to flush during the cleanout process.
8. Clean remaining gasket material from tank and element flanges. Do not reuse original element gasket. The element gasket is Part No. 5109.
9. Replace elements as follows:
   - Put a new gasket on each element.
   - Install into tank opening.
   - Uniformly tighten element bolts. Torque to approximately 32 ft/lbs.
10. Connect element wiring as necessary.
11. Follow FILLING instructions to restore boiler to service.
    - Check for water leaks around elements and proper operation when boiler is filled.
    - Replace insulation and cabinet panel.

CHECKLIST

Before calling for service, check the following points to see if the cause of trouble can be identified and corrected. Reviewing this checklist may eliminate the need of a service call and quickly restore the boiler to service. The illustration on page 5 identifies the location of most of the boiler components.

BE SURE TO TURN OFF THE ELECTRICITY WHEN CHECKING EQUIPMENT.

Not enough or no heat

1. Be certain the electrical disconnect switch serving the boiler is in the ON position. The pilot switch(es) on the cabinet front should be on.
   - In some installations the boiler electrical service may be limited by the power company or boiler controls. If the boiler operates on a controlled circuit heat may be effected.
2. Check the fuses.
   - The electrical disconnect switch usually contains fuses.
   - The boiler has fuses located behind the cabinet door, see page 5 for location.
3. If the water was excessively hot, and is now cold, the high temperature cutoff may have operated (manual reset equipped models).
   - To reset, turn off electricity and remove the back panel and push the reset button.
   - Repeated operation of the high temperature cutoff should be investigated by your servicer.
4. The capacity of the boiler may have been exceeded by a large demand for heat.
   - Large demands require a recovery period to restore water temperature.
5. Sediment or lime scale may be affecting boiler operation. Refer to MAINTENANCE for details.

Water is too hot

1. Refer to TEMPERATURE REGULATION.

Boiler makes sounds

1. Sediment or lime scale accumulation on the elements may cause sizzling and hissing noises when the boiler is operating.
   - The sounds are normal , however, the tank bottom and elements should be cleaned. Refer to MAINTENANCE for details.
2. Some of the electrical components of the boiler make sounds which are normal.
   - Contactors will “click” or snap as the boiler starts and stops.
   - Transformers and contactors often hum.

Water leakage is suspected

1. Check to see if the drain valve is tightly closed.
2. If the outlet of the relief valve is leaking it may represent:
   - Excessive water pressure or air in the system.
   - Faulty relief valve.
3. Examine the flange area of the elements and tank cleanout for gasket leakage.
   - Tighten the bolts or, if necessary, follow the WATER AND LIME SCALE REMOVAL procedure to replace the gaskets.

SYSTEM WATER TEST

System water test

Review SYSTEM CLEANING section, for a description of six problems which result from loss of system chemical stability. Chemical stability is checked by:

1. Draw off water from system. Is it dirty, discolored or odorous?
2. What is the pH of the system water? It should be neutral or slightly alkaline.
3. Does “air” purged from system vents burn? If so, the “air” is actually gas.

If any of the above conditions are present, all waterways should be cleaned and the water adjusted to an alkaline condition.

If you cannot identify or correct the source of malfunction:

1. Place the boiler electrical disconnect switch in the OFF position.
2. Close the make-up water inlet valve to the boiler.
3. Contact your servicer.

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NW-37 THRU NW-670 ELECTRIC HOT WATER BOILER LIMITED WARRANTY

A.O. Smith Corporation, the warrantor, extends the following LIMITED WARRANTY to the owner of this boiler.

1. THE TANK

If the tank in this boiler shall prove upon examination by the warrantor to have leaked due to natural corrosion from water therein, during the FIRST year after initial installation, the warrantor will at its option, repair it or provide a replacement tank less elements and controls of equivalent size and then current model. Some government agencies are requiring energy efficient standards for boilers. In the event regulations prohibit sale of a model of equivalent size and construction, A.O. Smith will provide a model which complies with the regulations of your area, in which case the consumer will be charged the difference in price between the like replacement and the energy efficient model required. The warranty on the repair or replacement of the part, portion or tank will be limited to the unexpired term of the original warranty.

2. ALL OTHER PARTS

If within ONE year after initial installation of this boiler, any part or portion shall prove upon examination by the warrantor to be defective in material or workmanship, the warrantor will repair or replace such part or portion at its option.

3. CONDITIONS AND EXPECTATIONS

This warranty shall apply only when the boiler is installed in accordance with local plumbing and building codes, ordinances and regulations, the printed instructions provided with it and good industry practices. In addition, a pressure relief valve, approved by the American Society of Mechanical Engineers, must have been installed.

This warranty shall apply only when the boiler is used:

a. (1) at temperatures not exceeding the maximum setting of its control;
(2) at water pressure not exceeding the working pressure shown on the boiler;
(3) when filled with water, free to circulate at all times and with the tank free of damaging scale deposits;
(4) in a noncorrosive and non-contaminated atmosphere;
(5) in its original installation location;
(6) in the United States, its territories or possessions, and Canada.
(7) when operated free of the damaging effects of uncontrolled thermal expansion and/or water hammer.

b. Any accident to the boiler, any misuse, abuse (including freezing) or alteration of it, any operation of it in a modified form will void this warranty.

4. SERVICE AND REPAIR EXPENSE

Under this limited warranty the warrantor will provide only repair or a replacement tank or part thereof. The owner is responsible for all other costs. Such costs may include but are not limited to:

a. Labor charges for service, removal, repair, or reinstallation of the tank or any component part;
b. Shipping, delivery, handling, and administrative charges for forwarding the new tank or replacement part from the nearest distributor and returning the claimed defective tank or part to such distributor.
c. All cost necessary or incidental for any materials and/or permits required for installation of the replacement tank or part.

5. LIMITATION ON IMPLIED WARRANTIES

Implied warranties, including any warranty of merchantability imposed on the sale of this boiler under state law are limited to one (1) year duration for the tank or any of its parts. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

6. CLAIM PROCEDURE

Any claim under this warranty should be initiated with the dealer who sold the boiler, or with any other dealer handling the warrantor's products. If this is not practicable, the owner should contact:

U.S. Customers
A.O. Smith Corporation
5621 W. 115th Street
Alsip, IL 60803
Telephone: 800-323-2636

Canadian Customers
A.O. Smith Enterprises Ltd.
P.O. Box 310-768 Erie Street
Stratford, Ontario N5A 6T3
Telephone: 519-271-5800

a. The warrantor will only honor replacement with identical or similar tank or parts thereof which are manufactured or distributed by the warrantor.
b. Dealer replacements are made subject to in-warranty validation by warrantor.

7. DISCLAIMER

NO OTHER EXPRESS WARRANTY HAS BEEN OR WILL BE MADE IN BEHALF OF THE WARRANTOR WITH RESPECT TO THE BOILER OR THE INSTALLATION, OPERATION, REPAIR OR REPLACEMENT OF THE TANK OR PARTS. THE WARRANTOR SHALL NOT BE RESPONSIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OR DAMAGE TO PERSONAL PROPERTY, OR OTHER CONSEQUENTIAL DAMAGE. THE WARRANTOR SHALL NOT BE LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR DAMAGE TO ANY PERSONS OR PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT OR IN TORT.

a. Some states do not allow the exclusion or limitation of the incidental or consequential damage, so the above limitation or exclusion may not apply to you.
b. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Fill in the following for your own reference. Keep it. Registration is not a condition of warranty. The model and ASME numbers are found on the boiler's rating plate.

Model No._____ASME No._____Date Installed_____

Dealer's Name_____

Dealer's Address_____Phone No._____

City and State_____Zip_____

KEEP THIS WARRANTY AND MANUAL POSTED ADJACENT TO THE BOILER FOR FUTURE REFERENCE WHENEVER MAINTENANCE, ADJUSTMENT OR SERVICE IS REQUIRED. BE SURE YOUR DEALER HAS FILLED IN THIS WARRANTY.

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